This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

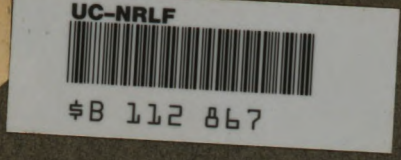
+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

TD
425
M8



XC103715

Digitized by Google

EXCHANGE

SIGILLVM · VNIVERSITATIS · CALIFORNIENSIS

FIAT LVX

MDCCCLXVIII

EX LIBRIS

SEP 23 1912
EXCHANGE

Canada

COMMISSION OF CONSERVATION

COMMITTEE ON PUBLIC HEALTH

THE PREVENTION of the POLLUTION of CANADIAN SURFACE WATERS

By
T. Aird Murray, M. Can. Soc. C.E.

Ottawa, Canada, 1912

PRINTED BY
LOWE-MARTIN COMPANY, LIMITED
OTTAWA

Digitized by Google

TD 1-5
M8

UNIV. OF CALIFORNIA

EXCHANGE

PREFATORY NOTE

This pamphlet is a reprint of a series of three articles written for the Toronto Globe, by Mr. T. Aird Murray. The first article was published on December 30th, 1911, and the others early in January, 1912. The purpose of the reprint is to put the material in the articles in a more permanent form, and also to give them still wider publicity.

Digitized by Google

UNIV. OF CALIFORNIA

The Pollution of Water Supplies

I

Necessity for Federal Control

THREE years ago a bill was introduced in the Canadian Senate entitled "An Act respecting the pollution of navigable waters." The bill got its second reading with the understanding that it would be referred to the Commission of Conservation, to be dealt with during the following recess of Parliament. At the following session (1911) the Commission of Conservation presented a new bill for the consideration of the Senate. The bill, after receiving a very full discussion in the Senate and by the Committee on Public Health in the Senate, was unanimously passed. It was not, however, considered in the Commons because of the unexpected dissolution of Parliament.

Senate Legislation

This year (1911) on the first day the Senate met, Senator Belcourt again introduced the bill. It was discussed briefly, and after a second reading was again referred to the Committee on Public Health.

There is little doubt but that this bill or a similar bill, will become a law in the near future.

The bill, briefly, provides as follows:

"Every person is guilty of an offence against this Act, and liable on summary conviction to the penalties hereinafter provided, who puts, or causes or permits to be put, or to fall, flow, or to be carried into any navigable water, or into any other water any part of which is navigable or flows into any navigable waters—

916678

Digitized by Google

"(a) Any solid or liquid sewage matter; or

"(b) Any other solid matter which, not being sewage is poisonous, noxious, putrid, decomposing, refuse or waste; or

"(c) Any liquid matter which, not being sewage, is poisonous, noxious, putrid, decomposing, refuse or waste; unless such matter, whether solid or liquid, is disposed of in accordance with regulations or orders made or permits granted under the authority of this Act."

Dominion Regulation of the Pollution of Waterways

The principle of Dominion regulation with reference to navigable waters as embodied in the above bill is not entirely new. It has already been laid down that the Dominion may pass legislation affecting the dumping of sawdust. On the other hand, the Dominion Parliament has not in the past attempted to regulate the question of sewage pollution, and this phase of the subject presents a novel feature in Dominion control.

Up to the present the question of sewage pollution has been relegated to Provincial authorities, with the result that little indeed has been done in Canada in the matter of conserving the natural purity of surface waters.

There appears to be a general consensus of opinion among those representing Provincial health authorities that the time has come when some definite action must be taken by the Dominion Government. On October 12-13, 1910, the Public Health Committee of the Commission of Conservation convened a joint conference at Ottawa at which were represented the public health officials of the various Provinces as well as the Dominion officials connected with public health administration. This conference resulted in a report, which in part stated:

"Whereas the pollution of the waterways of the Dominion by raw sewage and factory wastes is a menace to the health of the public by reason of the contamination of public water

Digitized by Google

supplies as indicated by the excessive mortality from typhoid fever alone, etc."

The report then goes on to point out that the question is National as well as Provincial, as Provincial authorities only have jurisdiction over the waterways within their own boundaries and are unable to protect those resident against pollution which may happen either in a contiguous province or in an adjoining country. The conference recommended that the Dominion of Canada enact a law on the lines of the draft bill, this being the bill now before Parliament.

It will thus be seen that the Provincial health authorities will welcome any Dominion legislation on this question, and are not inclined to view the matter in the light of interference with Provincial rights.

The Powers of the Provinces

It is unquestionable that the provincial authorities may by enactment, prohibit the pollution of surface waters within their own boundaries. The difficulty in the past has been the adoption of some effective method of enforcing legislation. The province of Saskatchewan, however, appears to have solved the difficulty, by enacting that no money by-law is valid or can be submitted to the people until such time as the consent of the Provincial Government has been obtained to any system of sewerage or water supply. The provincial health authority of Saskatchewan is represented by a Bureau of Public Health administered by a Commissioner, and while no purity standard is laid down, each scheme is considered on its merits with reference to local conditions, and the Commissioner establishes a standard relative to each particular circumstance. It would appear that this precedent is likely to be followed by other provincial health authorities; in fact, the conference of the Dominion and Provincial Health Officers adopted the following resolutions:

Legislation in Saskatchewan

"That the Legislatures of the Dominion of Canada be recommended to insert in their public health acts a clause as

Digitized by Google

Resolutions of Dominion Health Conference, 1910

follows: No by-law providing for the raising of money for the construction, operation or extension of any system of waterworks or common sewer or system of sewerage or sewage disposal shall be submitted to the votes of the electors by the Council of any municipality until the consent of the Commissioner of Public Health or of the Provincial Board of Health, as the case may be, to the proposed construction, operation or extension has been first obtained, and the preamble to every such by-law shall declare that such consent has been duly obtained; no debenture shall be valid if issued under any by-law passed in contravention of the provisions of this section."

In addition to the province of Saskatchewan, Ontario and Manitoba have recently adopted the above clause.

Necessity for Dominion Control

The necessity of Dominion control as foreshadowed in the Belcourt bill, as apart from the partly efficient control now being adopted in the Provinces may be summed up under three main heads, viz.:

(a) The establishment of a central authority at Ottawa having Dominion supervision and direction in questions affecting surface water pollution, the collection of data, the direction of experimental work, and the diffusion of standardized information throughout the various Provinces.

(b) The establishment of a central authority having Dominion powers relative to interprovincial questions affecting the pollution of waterways which do not at present come under control of Provincial authorities.

(c) The establishment of a central authority having Dominion powers relative to international negotiations as between the Dominion and the United States in all questions affecting the purity of the Great lakes and their tributaries.

A precedent for the establishment of a central authority may be found in Great Britain, where the Local Government

Digitized by Google

Board, whose president holds cabinet position, practically controls all questions relative to river pollution, while the county councils and river boards administer the laws of prevention within their own boundaries. The precedent, however, is not capable of particular, but only of general application and practically only so far as the principle of the establishment of a central authority is concerned. Many of the duties fulfilled by the British Local Government Board would have to remain with the Provincial health authorities. In Britain it is necessary that all proposed schemes of sewerage, sewage disposal and water supply be submitted to the central authority in London. It would appear reasonable that a central authority at Ottawa should have the power to so direct and advise Provincial health authorities that unity of action in fundamental principles should be the basis of Provincial legislation.

Central Health Authorities in Britain

It is quite obvious that under the present conditions of isolated Provincial action only very localized phases of the subject can be dealt with from local points of view. For example the province of Ontario may have the most stringent laws relative to water pollution, and after putting its house in order would be yet dependent upon the action taken by the province of Quebec relative to the pollution of the Ottawa river whose banks are interprovincial. The same holds good with reference to the North Saskatchewan and South Saskatchewan rivers, which, after draining a greater part of the province of Alberta, enter and pass through the province of Saskatchewan, and practically form the most visible source of water supply for that province. There is little or no encouragement for the province of Saskatchewan in spending sums of money on sewage purification, if there is not some guarantee, based on Dominion law, that the adjoining province shall at no time be permitted to neglect its sewage-polluted waters. The same argument also holds good with reference to Saskatchewan and Manitoba.

The Defects of Provincial Control

Digitized by Google

From the question of interprovincial we at once step to the question of international regulations. Again, it appears quite obvious that it is hopeless to expect any efficient action on the part of provincial legislation with reference to the maintenance of the purity of the Great lakes, unless there is concerted action taken either by the federal government of the United States or by some joint agreement made with the various states which adjoin the lakes.

Provincial Control. International Regulation of Waterways

In the case of Winnipeg, the Red river has its source in the United States, and any dominion law compelling Winnipeg to cease polluting the Red river would yet leave the city of Winnipeg subject to optional preventive measures over which the Dominion may have no control.

The whole question of the prevention of pollution of surface waters is so broad that it is impossible that it can be effectually dealt with, unless dealt with as a whole by a central dominion authority having power to make or suggest international lines of action.

The United States owing to its constitution, has as yet been unable to determine upon any concerted line of Federal action. Each state is independent and while one state may have drastic laws with reference to river pollution, the adjoining state may have none. This was well illustrated by the adoption of the Chicago Drainage Canal, which is a simple but barbaric method of turning the city sewage from its own waterfront to a river flowing into and through neighbouring states, and which resulted in long and costly lawsuits between Chicago and St. Louis.

Regulation in the United States

The Chicago Drainage Canal

At the present time the question of the maintenance of the purity of the great lakes is agitating both the United States and Canada, and a concerted effort is being made in order to arrive at a common basis of action.

Digitized by Google

International Conferences

Canadian and United States representatives have lately met in conference at Chicago and at Cleveland, and a line of action has been determined upon in order to obtain necessary data on which an international policy may be suggested.

The psychological moment for Canada appears to have arrived when it can well afford to formulate a Dominion policy relative to the prevention of pollution of surface waters and have that policy represented in a department centralized at Ottawa.

Digitized by Google

II

Typhoid Fever and Stream Pollution

CANADA is a big country, and conditions in different parts of the Dominion are not altogether comparable. Fortunately in the East we have an abundance of water, as represented by the great lakes and rivers. Unfortunately, in the middle West water is scarce. The necessity of the prevention of the pollution of waterways is perhaps greater in the middle West than in the East. Consequently at the present time there is undoubtedly more being done in the middle West in the way of prevention of river pollution than in the East.

Canadian Domestic Water Supplies

Generally as compared with other populated countries Canada presents more favourable conditions with reference to its waterways and watercourses. For the most part, however, Canada has to depend more upon its waterways and watercourses for its domestic supply than most other countries. For example, in Great Britain, in very few cases do the cities and towns obtain their water supplies from waterways or watercourses receiving sewage discharges. Apart from the city of London, which takes its water supply from the upper reaches of the Thames and its tributaries, most of the centres of population obtain their supplies from upland collecting areas in the uninhabited portions of the mountain ranges of Central England, Wales, Cumberland, Westmoreland, the Cheviots, and the lochs and mountain ranges of Scotland.

Domestic Water Supply in Great Britain

In Great Britain the question of the prevention of pollution of streams has not been viewed so much from the water supply point of view as from the view of preventing a visible nuisance, by turning the streams into open sewers. Condi-

Digitized by Google

tions in Great Britain are not exactly comparable with conditions in Canada. On the other hand conditions in parts of United States are comparable with those in Canada. In the States we find at the present time, practically all the waterways and watercourses in the populated districts hopelessly contaminated to such an extent that they are unfit as sources of water supply unless artificially treated.

Conditions in the United States

Unless stringent and early measures are taken in Canada, history will repeat itself, with the ever increasing population and city growth.

Limited rainfall, general lack of unpopulated upland districts forming collecting water-sheds, excessive evaporation in summer, absorbent subsoils, vegetable and algae growths peculiar to hot summer regions, all point to the fact that the waterways and watercourses must combine to form the chief sources of domestic water supply in Canada, just as they do in many parts of the States.

It is not sufficient to say "it is possible to filter or purify a polluted water." It is better to have an unpolluted water, and it is better to have to filter or purify a slightly contaminated water than an altogether contaminated water.

Typhoid fever is acknowledged to be a water-borne disease, and sanitarians judge of the purity of a water supply by the typhoid mortality rate. Dr. Hodgetts, medical adviser to the Commission of Conservation, at the conference between Provincial and Dominion health officers in 1910, produced some very striking figures relative to typhoid rates in several countries. He showed the mortality rate per 100,000 of population in Scotland to be 6.2; in Germany, 7.6; in England and Wales, 11.2; in Belgium, 16.8; in Austria, 19.9; in Hungary, 28.3; in Italy, 35.2; in Canada, 35.5; and in the United States, 46.0.

Typhoid Fever

The two countries which represent the highest typhoid rates, viz., Canada and the United States, are practically

Digitized by Google

dependent upon waterways and watercourses for their domestic supply.

Typhoid Statistics

The typhoid mortality rate for the year 1909 at Edmonton was 76.0, at Montreal, 53.8; at Saskatoon, 66.6; at Ottawa, 31.2; at Niagara Falls, 24.3; and at Toronto, 25.7. All of these centers of population obtain their water supply from waterways or watercourses.

In the United States the following cities bordering on the Great lakes showed typhoid mortality rates in 1908, as follows: Ashtabula, 86.2; Buffalo, 20.7; Detroit, 22.3; Duluth, 56.8; Niagara Falls, 98; Ogdensburg, 33.6; Sault Ste. Marie, 72.9; Toledo, 40.1; while Chicago, which diverts its sewage from the lake, had the comparatively low rate of 15.3.

Dr. Hodgetts also made the statement that any excess over a rate of 20 per 100,000 in typhoid mortality indicated a sewage-polluted water supply. This statement appears to be practically accepted by epidemiologists. If it is true—and there appears to be no reason for concluding otherwise—then over 1,000 lives are sacrificed annually in Canada to conditions which are preventible. If we are allowed to reach the conditions obtaining in the States then 2,000 of Canada's present population will be sacrificed annually to this neglect. The above figures alone should be sufficient to show that the necessity has arisen in Canada for taking immediate steps in order to strengthen its laws for the prevention of the pollution of its waterways and watercourses.

The Fort William Typhoid Epidemic

A clear example of the fact that typhoid is water-borne occurred at Fort William in 1906. The intake pipe supplying the city with water, remained in a damaged condition for some time and sewage obtained a direct entry into the water supply service. The result was: ninety-six deaths from typhoid in one year in a population of less than 10,000, or a typhoid mortality rate of 946.9 in

Digitized by Google

100,000. In fact, out of every ten citizens, one was down with the disease.

The Sarnia Typhoid Epidemic

The town of Sarnia, Ont., presents the most recent example of typhoid being borne by water. Sarnia obtains its water supply from the St. Clair river, acknowledged to be sewage-polluted, and during the last week in December, 1911, developed ninety-three cases of the disease with a population of 10,000. Of course the citizens are now chlorinating the water.

Conditions in Pembroke

Pembroke, an old Ontario town on the banks of the Ottawa river, has a population of over 5,600. Opposite the town, the river widens out into a practically quiescent lake, and the thickly populated area is situated on the shore of a bay in this lake. The water of the bay moves with the direction of the wind, and there is no defined current. The intake pipe for the water supply is extended for 2,500 feet into this bay. Into the same bay, practically the whole of the town's sewage is discharged. In the year 1908, the town lost sixteen citizens from typhoid, with over four hundred cases. In 1909, deaths to the number of seventeen occurred. Early in 1910, a chlorinating plant was installed with the result that the deaths from this disease were reduced to seven. During this year, 1911—chlorination having been continued without interruption—the town has been practically free from typhoid. The town has recently installed a new water supply from a point beyond the zone of sewage contamination, and also contemplates in the near future dealing efficiently with its sewage discharge. Numerous other examples of a similar character can be quoted, such as the typhoid epidemics at Montreal, Ottawa, Toronto in the spring of 1910, etc., in all of which cases the disease has been traced to drinking water contaminated with sewage.

Not only directly by water supply may the infection of typhoid be spread, but also through milk, especially when

Digitized by Google

Milk and Typhoid Infection

the farmer has to rely upon a contaminated water source for washing the milk cans and utensils. In 1909, the Commissioner of Health for Saskatchewan definitely traced several cases of typhoid at Moose Jaw to the milk supplied by a farmer residing ten miles below the city. The municipality discharges its sewage, after removing the solids only, into the Moose Jaw creek, while it obtains its water supply from an independent source. The farmer used this creek water in connection with his dairy, with the result that several cases of typhoid developed among those citizens using the milk. The city of Moose Jaw is now installing modern sewage purification works, with the object of destroying the germs of disease before the effluent enters the creek.

The question is sometimes asked: "How far must sewage flow in a stream before it becomes purified or innocuous?" In answering this question, it is very common to confuse the issue by lack of an understood definition as to what purification of sewage means.

In Great Britain where the object is not, generally, to provide sewage effluent which can be safely mixed with a drinking supply source, purification is understood to include only the removal of those attributes which will cause a nuisance. This definition of sewage purification also holds good in the United States, where sanitarians rely more upon filtration and treatment of water supplies than upon the treatment of sewage. There are two distinct factors in connection with sewage purification:

Sewage Purification

(a) The removal of all causes which may effect a nuisance;

(b) The removal of all causes which may effect disease.

The first deals only with certain chemical changes which are identified with the organic matter in sewage, and the sewage is said to be purified when the organic matter is either thoroughly decomposed or has been rendered undecomposable by the absorption of oxygen, when it is said to be in a stable

Digitized by Google

condition. Most of the standard methods of sewage disposal such as are designed for the removal of solids and passing the liquids through filters, only perform the function of removing the nuisance. The second deals with the numerous sewage bacteria which pass away in the effluent under the ordinary methods of treatment, and is, generally, named the removal of pathogenity or, in other words, the method of destroying or holding back just those qualities appertaining to sewage which cause typhoid and kindred diseases.

Now, when the question is asked: "How far must sewage flow in a stream before it becomes purified?", it is necessary to know whether the question refers to merely chemical purification or bacteriological.

For example: The sewage of the city of Buffalo is discharged into the Niagara river above the Falls; it becomes diluted with the river water and is thoroughly oxidized in passing over the falls and through the rapids. At Niagara-on-the-Lake, the sewage is purified chemically, that is, all the organic matter is oxidized. On the other hand, the river water at Niagara-on-the-Lake is not fit to drink, as the bacteria peculiar to sewage have not by any means been destroyed but continue to be active. This has been well illustrated by the numerous cases of intestinal complaints which occur amongst the men stationed at the military camps who use this water. As soon as the river enters lake Ontario the bacterial counts gradually diminish as the water enters upon a quiescent state. This means that a quick running, turbulent stream will chemically purify sewage, but that a slow running stream acting as a settling basin is required to remove the sewage bacteria. This point has been well illustrated by the bacterial purification effects that the huge storage basins have upon the water supply of the city of London, England.

How far sewage bacteria will travel in running streams, it is impossible to say, as so much depends upon the stream conditions. With rivers which freeze over we know that even

Digitized by Google

raw sewage can be carried considerable distances and the bacteria in fact are transported in cold storage.

Sewage Disposal in the Great lakes

There is no question but that the Great lakes are equal to oxidizing the sewage of all and many more cities than at present discharge into them, but that is not the point. If it were merely a question of the æsthetic nuisance, no more need be demanded of sewage purification in connection with the Great lakes than the removal of the grosser solids. But it is a question of water supply, and a question of those bacteria peculiar to sewage affecting a water supply.

The following resolution was adopted by the Lake Michigan Water Commission, September 10, 1908:

"Whereas occasionally currents of considerable velocity, say, several miles per hour, may be expected to arrive from almost any direction at any point reasonably near either shore of the lake;

"Resolved, that while, in the opinion of the Commission, the direction of predominating currents should be considered in determining the relative position of sewer outlets and waterworks intakes, nevertheless it is the sense of this Commission that, if the waters of the lake are polluted by the discharge into it of large quantities of sewage, then localities in the lake, even *twenty or thirty miles distant from the point of entrance of the sewage*, and in any direction therefrom, are not safe places from which to derive water for domestic use."

The above conclusion has been practically borne out by the recent chemical and bacteriological investigations lately made by the Commission now examining into the question of the water supply for the city of Toronto.

It is not sufficient to say filter or treat a city's water supply. There must be, and always will be, untreated volumes of

Digitized by Google

water consumed by the holiday-maker and the floating population on a lake.

Canada has conditions peculiarly its own in this connection, and it must face the problem not only of the duty of the water-provider insuring a pure water supply, but also the duty of the sewage-producer to do all that is practicable to keep out of waterways and watercourses those particular attributes connected with sewage which have the power of transmitting disease from man to man by means of water.

Digitized by Google

III

Sewage Purification and Sterilization

THE amount of work done to date in Canada with reference to the prevention of the pollution of surface waters is infinitesimal.

In the two preceding sections it has been shown that there is a decided feeling in the public mind that something more should be done in the immediate future than has been done in the past. This is evidenced by the Belcourt bill which, for some time, has been before the Senate. It has also been clearly shown that Canada is already suffering in its typhoid death rate because of past neglect.

Further, it is clear that conditions in Canada are not altogether comparable with those in most other countries, where sewage disposal has claimed attention. In Canada, as well as in parts of the United States, waterways and watercourses must continue to serve as the main sources of domestic water supply.

Inquiry by Canadian Society Civil Engineers

A Committee of the Canadian Society of Civil Engineers sent out question forms last year to municipalities all over the Dominion with a view to collecting data respecting the number of sewerage systems in Canada which discharge into waterways, and where and how this sewage is dealt with. Sixty-four places reported combined sewerage systems, thirty-eight separate systems and sixty-four no sewerage; thus making a total of 102 sewerage systems reported.

Of this number, eighty-nine reported discharges into fresh water and thirteen into salt water unfit for water supply. Of this number, only eighteen places reported any kind of

Digitized by Google

attempted purification, and twelve of them were limited to tank treatment for the removal of solids only.

The above questions were sent to 327 places, and only 166 replied.

Mr. Willis Chipman, in a paper read before the Canadian Public Health Association in 1911, on the history of sewage disposal in Canada, practically admitted that little or nothing had, as yet, beendone, apart from certain spasmodic instances which have, generally, been forced by some definite local cause. He stated, too, that, *in most cases, there has occurred a decided lack of interest and consequent neglect with reference to most sewage plants installed.*

Apart, however, from these somewhat discouraging returns to the Society of Civil Engineers, there are several places which have of late, entered into the practical question of modern sewage purification, and have such works now under construction. Another year will see at least twelve modern sewage disposal installations completed in the East and West, and this number will probably, be constantly added to.

In the previous sections, stress has been laid upon the necessity of that form of purification which deals with the disease-transmitting attributes of sewage, and its special value relative to Canadian conditions, where waterways will practically continue to serve as sources of domestic water supply. Here, however, it is well to point out that no absolute standard or method of sewage purification can be laid down for universal adoption. Local circumstances must always be a guiding factor.

The whole problem of sewage purification is, at the present time, capable of a certain amount of crystallization, and the question of just what should be done in order to obtain the destruction of disease infection, or any lesser or other form of purification, can be answered in general terms. The tendency in Canada will probably be, and certainly is, to *uselessly*

Digitized by Google

Wasteful Experiments

expend time and money on experimental work in order to prove what has already been made axiomatic by the work of other countries, apart from concentrating our efforts on experimental work peculiarly Canadian. It is in this connection that the benefit of a central authority would make itself evident. A well-organized Dominion Department of Public Health would be in a position to employ chemical, biological and engineering experts fully acquainted with the practical and experimental work already done in sewage disposal. This department, studying the whole question relative to Canadian conditions, would be in a position to advise Provincial and Federal authorities in such a way that legislation and action would be as uniform as possible, and, at the same time, the maximum efficiency would be obtainable. This would save the cost of duplication of experimental work throughout Canada, with consequent partial failures and loss of money.

A Dominion Health Department

The history of sewage disposal in Great Britain and other countries has been one of experiment. An immense sum of money has been necessarily spent on this work, and many municipalities have passed through three or more stages or methods of sewage disposal in an effort to keep up with modern systems and conclusions.

Canada, by a proper and comprehensive grasp of the history and conclusions with reference to sewage disposal in other countries and their proper application to its own conditions, may save in the future enormous sums of money which otherwise would be wasted in going over old ground.

Biological System of Sewage Disposal

The method of disposing of sewage on land, apart from the fact that, as an efficient process, it is being discontinued in most countries, does not appear suited to the Canadian conditions of extreme frost, and this system may be practically left out of consideration. The modern method of purification is that named "The biological." This system formed the subject of an interesting

Digitized by Google

symposium at the annual meeting of the Canadian Public Health Association in 1911, and was very fully dealt with. Systems now being installed in Canada are in accordance with this method. Its great advantage over any system of land treatment is in the small area of land required and the ease with which the whole plant can be protected from frost. This system is named 'biological' because the changes which the sewage undergoes are mainly due to micro-organisms connected with the processes of decomposition and oxidization of organic matters.

The biological system may be divided into three distinct processes, with the added process of disinfecting the sewage for the further removal of sewage bacteria when required, the processes being as follows:

(a) The removal of the greater proportion of the suspended solids in sewage.

(b) The removal of the tendency to decomposition by oxidizing the sewage liquor after the greater proportion of the solids are removed.

(c) The final removal of practically all the remaining solids after they have been oxidized.

Standard Methods for Obtaining Sewage Effluents

The above processes are generally accomplished by (a) sedimentation tanks, in which the greater proportion of the solids are allowed to settle and subsequently removed, while floating matter is skimmed from the surface; (b) rough filters of broken stone, slag, etc., through which the sewage is allowed to trickle in the presence of the atmospheric oxygen; (c) final sedimentation basins or coarse sand filters, which settle out the oxidized solids which pass through the filters.

The above may be described as the standard methods for obtaining a sewage effluent which will create no nuisance and which will not undergo further decomposition. These processes are, however, insufficient in themselves to create a

Digitized by Google

sewage effluent which can be safely discharged into a domestic water supply source. *The processes are not designed for the removal of sewage bacteria but only for the removal of those chemically organic attributes which create a nuisance by decomposition.*

If it is desired to render the sewage effluent fit to turn into a water used as a domestic supply, then the effluent by the above three processes can be readily disinfected by the addition of very small quantities of hypochlorite of lime, as low as two parts in 1,000,000.

Sewage Disinfection

It may be argued that if the object is to disinfect a sewage effluent and protect a water supply, then why trouble with the preliminary processes, especially when the sewage enters a large oxidizing body of water? Why not disinfect the raw sewage at once, or, in any case, disinfect the sewage liquor after the greater proportion of the solids are removed?

The answer is the great cost entailed and the difficulty of disinfecting a raw sewage with all of the contained solids, or even a sewage liquor minus the solids.

To disinfect the solids in sewage by any known method would mean the employment of some mechanical method of breaking them up into the finest particles possible, contact with the disinfecting media for days, and the use of probably about fifteen parts of chlorine to each 1,000,000 parts of sewage.

To disinfect the liquor from sedimentation tanks after the grosser and greater proportion of the solids are removed and before the liquor has been oxidized also requires large quantities of chlorine, probably ten parts in 1,000,000 with comparatively long periods of contact.

To disinfect the sewage effluent after the whole three processes above named, as we have seen, means only about two parts of chlorine in 1,000,000 of sewage.

Digitized by Google

Now, in most cases, it will be found that the capitalized annual cost of the difference in the amounts of chlorine required will more than pay for the installation of the plant required for the preliminary or standard processes for the removal of the nuisance qualities.

For example, suppose a city of 20,000 population, produces 2,500,000 gallons of sewage per day. To disinfect the liquid sewage after the solids have been partly removed, at ten parts of chlorine per 1,000,000 parts of sewage, with chloride of lime at one and one-half cents per pound, would cost annually for the lime $4,000. To disinfect this sewage after it has been thoroughly oxidized in filters and the remaining solids removed, at two parts of chlorine per 1,000,000, would mean an annual cost of $800 per annum. The difference in annual cost capitalized at five per cent. would represent a capital sum of $64,000. Filters for oxidizing sewage can generally be built at about $30,000 an acre, at six feet four inches in depth of crushed stone, and will handle two and five-tenths million gallons an acre of sewage a day. There is thus a capital saving of $34,000 by adopting disinfection as a final, rather than a preliminary process.

In writing this treatise the object has been to shed, if possible, further light upon the whole question of the original purity of surface waters in Canada. The question of prospective legislation has been casually touched upon. The necessity of immediate action, as illustrated by the loss of life by typhoid, has been put forward in a plain manner and fully illustrated by concrete cases. The practicability of adopting methods and measures for meeting the necessity has also been delineated.

The public are, however, the masters of the situation. They must find the money or suffer the effect of neglect. Legislation on public health matters, unless understood and conceded by citizens to meet a public want, is of little or no avail. Are we as Canadian citizens content to allow the

Digitized by Google

stigma of the second highest typhoid death rate in the civilized world to continue attached to Canada? Are we content that our beautiful lakes and rivers shall be turned into sewage disposal areas and open sewers? Not a bit of it. As individuals in this matter we can only devote our efforts to concerted action which will lead to legislation efficiently applied and generally welcomed.

Digitized by Google

Digitized by Google

UNIVERSITY OF CALIFORNIA LIBRARY

This book is DUE on the last date stamped below.

Fine schedule: 25 cents on first day overdue
50 cents on fourth day overdue
One dollar on seventh day overdue.

MAY 20 1947

LD 21–100*m*-12,'46(A2012s16)4120

Digitized by Google

Photomo
Pamphl
Binde
Gaylord Bro
Maker
Stockton,
PAT. JAN. 21,

Murray, T. Aird.
The prevention of the pollution of Canadian surface waters

MAY 20 1947

MAY 8 1947

916678

TD425
M8

THE UNIVERSITY OF CALIFORNIA LIBRARY

Digitized by Google

Digitized by Google